ABSTRACT

An optical heterodyne detection system includes an attenuator that receives an input signal and attenuates the input signal before the input signal is combined with a local oscillator signal. An optical coupler combines the attenuated input signal and the local oscillator to create a combined optical signal that is output to an optical receiver. The optical receiver generates an electrical signal that is representative of the combined optical signal. The electrical signal is utilized by a processor to generate an output signal that is indicative of an optical parameter of the input signal. The processor monitors a heterodyne signal that is a component of the combined optical signal to generate the output signal. The original input signal is attenuated before being combined with the local oscillator signal to improve the signal to noise ratio of the heterodyne signal, especially in the case where the intensity noise of the input signal is the dominant noise source for the combined optical signal. The signal to noise ratio improves with attenuation of the input signal because the heterodyne signal and the intensity noise of the input signal scale differently with attenuation of the input signal. The attenuation of the input signal may be adjusted to optimize the signal to noise ratio of the heterodyne signal. A feedback loop may be provided between the processor and the adjustable attenuator so that the attenuator can be adjusted in response to real-time measurements of the signal to noise ratio of the heterodyne signal.